

In search of gold: Exploring central bank issued digital currency

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Introduction

Kia ora and thank you to Payments New Zealand for the invitation to speak. Payments systems are highly interconnected by nature, so it is fitting that we are all here connecting with each other—learning, listening and discussing the hot topics in payments.¹

The payments system is an integral part of our financial system. It is also one that is evolving at considerable pace. We have already heard this morning about changing consumer demands and advances in financial technologies. Retail payments have become faster, and much easier to access. We can now initiate payments in a variety of ways – we can simply tap our credit cards, hold up our mobile phones, or pay for things remotely using a mobile banking app. Sellers at farmers’ markets can now receive card payments by plugging a small device into their mobile phones, and charities can now collect donations on the street using Q-code technology. All of these developments have made transactions more convenient, faster, and accessible for consumers and merchants. But they have mostly been concentrated at the front-end of the payments process.

Crypto-currencies, and the blockchain technology they rely on, are bringing about more far-reaching changes in the payments system and the way we view money. Blockchain technology is unique because there is no central agent managing the system, and there is no separation between sending the payment instruction and the final settlement of funds. It’s a different type of payment system and could bring new opportunities to payments and currency.

This period of change can be compared to an earlier time when exploration was fast-paced and the stakes were high—the 1860s, when the gold rush hit New Zealand. During this period, miners came from all over the world to find gold in our valleys and rivers. Gold, a form of money (in respect, then, of its payment and store of value properties), could be found by anyone with a bit of luck, determination and hard work.

The early 1860s gold rush is not unlike the search for wealth that has fuelled the speculation in privately issued crypto-currencies. But beyond the speculation surrounding Bitcoin prices, and the debate regarding whether it is a currency, an asset or a bubble, there lies a fundamental question—should central banks enter this terrain, and issue digital currencies of their own to the public?

The Reserve Bank has a strong record of innovation and welcomes technological progress.² However, when considering digital currencies, it should be remembered that riches did not come easily during the gold rush, and they will not come easily now. A central bank digital currency would be attractive to us if it could improve our currency distribution, payments efficiency and monetary or financial stability. But these benefits are by no means guaranteed, and could come at some cost. We must explore both the pros and the cons before deciding to issue digital currency of our own to the public. Many other central banks are doing the same.

So that is what I will do today. Like prospectors during the gold rush, I want to take you on a journey to uncover the risks, the gold, and possibly the fool’s gold, in issuing a central bank

¹ I am thankful for the assistance of Amber Wadsworth in preparing this speech.

² I spoke about our banknote innovation in 2014 “Brighter Money – enhancing innovation and embracing heritage”.

digital currency. I'll start by describing exactly what I mean by a central bank digital currency. I will then explore how issuing a central bank digital currency could impact some of the core central bank functions. I address three key questions:

- What could issuing a central bank digital currency mean for currency distribution?
- Can a central bank digital currency improve the current inefficiencies in payments?
- Would issuing a central bank digital currency destabilise the financial system?

To answer these questions I will draw from the material recently published in our central bank digital currency bulletin series.³

Finally, I will touch on regulatory aspects of privately issued digital currencies.

What is digital currency?

When I mention digital currency, or digital money, some of you might immediately think of crypto-currencies, like Bitcoin. Some of you might think of your digital account balances. And others might think of credit or debit cards. In fact, I am referring to all of these things. Digital currency includes all electronic forms of money that represent a store of value, medium of exchange (or payment) and unit of account.

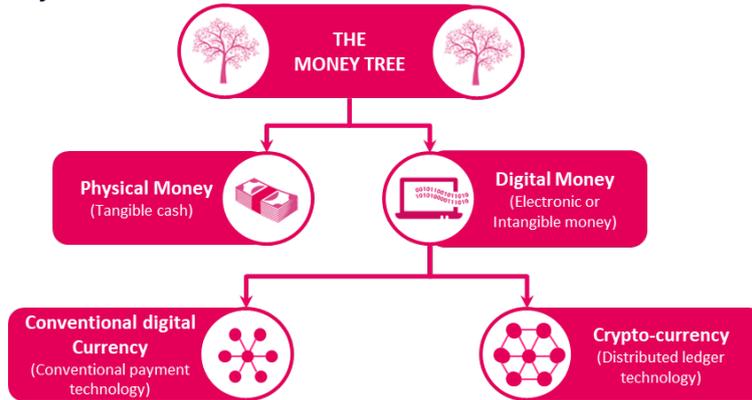
Unlike banknotes and coins (cash), digital currencies can be issued by anyone, which also means a wide variety of currencies have been issued. We can use the Money Tree (figure 1) to broadly class digital currencies into two groups—conventional digital currencies, which rely on existing infrastructure, and crypto-currencies, which rely on cryptography and distributed ledger technology (DLT).⁴

The most common example of privately issued conventional digital currencies are bank deposits. These electronic deposits carry a promise to be converted to fiat money—cash—at par value, which makes them very stable. The most common example of privately issued crypto-currencies is Bitcoin. These currencies are independent from fiat money, and not backed by other assets, which contributes to their notorious price volatility.

³ The central bank digital currency series comprises of three Reserve Bank *Bulletins*. The first article [‘What is digital currency?’](#) explains the various forms of digital currencies. The second article [‘Decrypting the role of distributed ledger technology for payments processes’](#) explains the ways the distributed ledgers differ from conventional payment systems, or not. The third article [‘The pros and cons of central bank issued digital currencies’](#) explores the implications of issuing a digital currency for currency distribution, payments, monetary policy and financial stability. I omit consideration of monetary policy implications in this speech.

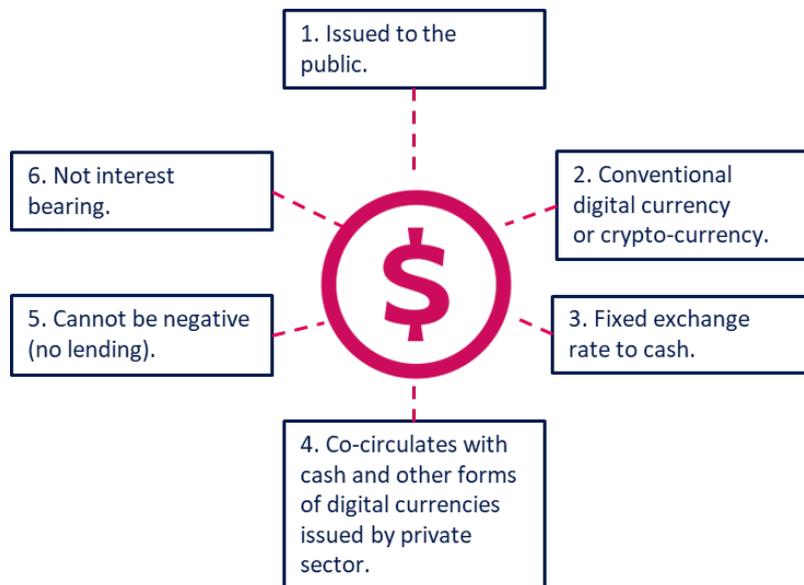
⁴ Cryptography refers to the conversion of data into a code that cannot be deciphered by unintended recipients, e.g. for transmission over a public network. DLT refers to a record of transactions or account balances (of crypto-currencies) that is shared across a group of entities. Blockchain is a form of DLT that is open source, and fully able to be downloaded, viewed and used by anyone.

Figure 1: The Money Tree



A central bank digital currency could take many different forms. So in order to explore the pros and cons of a digital currency issued by a central bank, I will set out six assumptions regarding the type of digital currency we are discussing today.

Figure 2: Key assumptions for a central bank digital currency



Our first assumption is that a central bank digital currency would be available to everyone. The Reserve Bank of New Zealand already issues a digital currency to commercial banks, through their accounts with us.⁵ But we could also offer digital currency to the public via accounts, prepaid cards, or some other mechanism.

Secondly, this digital currency could be a crypto-currency and use distributed ledger technology. Or it could be a conventional digital currency and based on existing payment technology. For example, a conventional currency could involve members of the public holding bank accounts at the Reserve Bank (i.e. account-based). Or it could involve members of the public holding currency on cards or other tokens, similar to prepaid cards e.g. Visa Prezzy cards (i.e. token-based).

⁵ The Reserve bank is currently reviewing its access policies to the wholesale accounts it provides to financial institutions.

Third, this digital currency would co-circulate with banknotes and coins (and other privately issued currencies). In New Zealand, we are not considering removing cash—demand for cash continues to grow as a share of the economy, and currently sits at 2.7 percent of GDP.

Fourth, a digital currency would be convertible to cash at a fixed rate rather than having a variable exchange rate. This would help develop trust in the value of the digital currency and would avoid introducing a dual currency system.

Fifth, we assume that the public could not borrow from the Reserve Bank. This means that the digital currency issued by the central bank would operate like cash.

Lastly, the central bank would not pay interest on balances of its digital currency. Again, this assumption means that the digital currency issued by the central bank would operate more like cash, which does not earn interest.

The pros and cons of issuing a central bank digital currency

Now that we have established what we mean by central bank digital currency, we can begin our exploration of its pros and cons. I liken this exploration to a search for gold because they both evoke images of venturing into new terrain in the hope of discovering something of great value. But such explorations were not without peril, and while they could lead to great rewards, they could also prove fruitless.

What could issuing a digital currency mean for currency distribution?

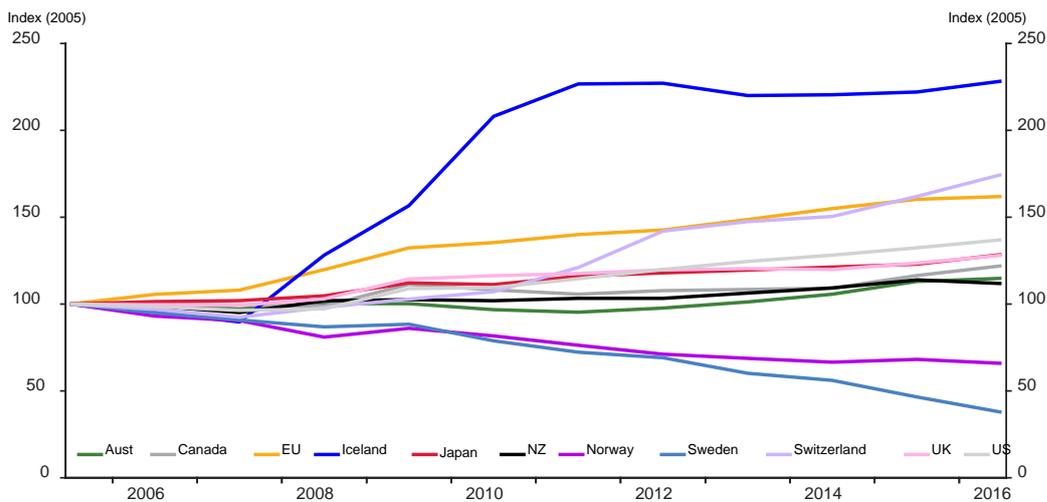
The Reserve Bank is the sole provider of banknotes and coins in New Zealand. These banknotes and coins must be easy to use, difficult to imitate, and safely and securely transported between the Reserve Bank and commercial banks. This is not a simple task. New Zealand's geography means that cash typically moves from Auckland, to the South Island. The Reserve Bank must then repatriate cash back to Wellington for quality inspection and re-issuance. A digital currency has clear distributional benefits compared to banknotes as it does not need to be transported. This makes it safer and cheaper.

Issuing a central bank digital currency would also ensure public access to legal tender money regardless of the presence of cash.⁶ New Zealand is in the rare situation among advanced economies where we use electronic forms of payments for the majority of transactions,⁷ but are simultaneously seeing cash demand grow at a faster rate than GDP.

⁶ Cash (otherwise known as fiat currency) is the only form of legal tender money available to the public. Legal tender money refers to money that is legally recognised as a valid form of payment and represents a claim on the central bank or government. (McBride, 2015).

⁷ Credit and debit card payments are very popular in New Zealand, with only 10 percent of the population using cash more than seven times a week.

Figure 3: Cash in circulation for advanced economies (percent nominal GDP)



Source: Haver Analytics

However, we do not know what could happen in the future. If cash demand falls significantly then retailers and banks might lose the incentive to provide ATMs and cash tills, which are costly to maintain.⁸ If cash demand fell to the point where retailers and banks no longer accepted, nor issued, it then legal tender money might disappear. This is the scenario faced by Sweden. A digital currency would provide an alternative, electronic form of legal tender.

Issuing a digital currency would also pose some currency distribution challenges:

1. Significant investment in new infrastructure would be required to create, issue and maintain a digital currency network (issuing accounts or tokens to the public).
2. Consumers could lose large sums of money, which might not easily be recovered, if people accidentally lost (by accident or theft) the device on which their token, or crypto-currency is stored. Consumers can also lose cash, but because cash is relatively bulky, we do not tend to hold or carry large sums.
3. It would be vulnerable to outages in electricity and internet connections. This would make it less reliable (than cash) in a state of emergency.

Can a central bank digital currency improve on the current inefficiencies in payments?

We are also interested in the payments efficiency aspects of a central bank digital currency. The payment implications differ depending on whether the central bank issued a conventional digital currency or a crypto-currency.⁹

A central bank issued, conventional digital currency could improve settlement speed and transaction fees compared to existing payments.¹⁰ This is because the currency would be centralised and transactions would be settled by a central bank updating account balances.

⁸ For example, retailers who accept cash must then perform end-of-day balancing to ensure all cash is accounted for, they must then bundle cash into safes and pay for it to be securely transported to banks. Likewise, bank branches must invest in secure infrastructure to transport cash among their branches and ATM networks, and store cash in branches.

⁹ Detailed analysis on how DLT can change payments systems is provided in Wadsworth (2018b).

¹⁰ Transaction fees could decrease compared to current electronic fees as the number of service providers for electronic payments would be reduced and authorisation, clearing and settlement could be conducted by the central bank.

These improvements would be most beneficial for cross-border transactions, which are currently subject to lengthy delays and large fees (and lack of transparency).

A crypto-currency issued by a central bank presents a more mixed argument for payments efficiency. DLT combines clearing and settlement into a single step called validation. However, how this impacts the payments process depends on the design of the technology. If a central bank issued crypto-currency was based on Blockchain then it would circumvent the existing conventional payment system and benefit from several pros:¹¹

- Faster settlement, which reduces default risk.
- Cheaper cross border transactions.
- Transparent payments, which incentivises faster payments processing.
- No single point of failure, which increases resilience to cyber-attacks and operational failures.

However, it would also be subject to several cons:

- Slower release of goods and services due to slow confirmation of the payment.
- High energy use for validation, and relatively high fees for domestic payments.
- Not scalable to large volumes of transactions due to the longer time taken to validate each block of transactions.
- Probabilistic finality—there is a very small chance that the transaction could be nullified if a malicious agent managed to change the blockchain.
- Reliance on crypto-currency exchanges for cross-border transactions which could be subject to cyber-attacks.

A central bank could mitigate these cons by introducing limited access, central validation, and control to the ledger.¹² This would improve the speed, cost and scalability of payments, and enable deterministic payment finality (similar to existing payments) and privacy for sensitive information. However, it would reintroduce a single point of failure. Experiments by the Bank of Canada and Monetary Authority of Singapore revealed that these centralised DLTs are very similar to existing payments systems, without additional benefits.¹³

Lastly, either token-based conventional digital currencies or crypto-currencies issued by the central bank could offer more anonymity than conventional electronic payments. For example, a central bank could issue a card or token that is not linked to an individual's identity. This means payments with these tokens offer partial anonymity. I.e. we might find recent purchases no longer show up in our social media adverts. However, any form of digital currency would leave an electronic record of transactions and so be less anonymous than cash. These records could be helpful in deterring tax evasion and illegal transactions.

¹¹ Blockchain is a form of DLT that is public, permissionless, non-hierarchical and open-source. In other words, anyone can read, download and validate transactions on the ledger. To validate transactions a miner must provide 'proof of work', supported by a network of users. This means finding a 'hash', which represents all the details in the block of transactions, by solving a cryptographic problem using brute computing power. The cryptographic problem is designed to take about 10 minutes to solve.

¹² By issuing a permissioned, private, hierarchical and closed-source crypto-currency.

¹³ Payments Canada, Bank of Canada, and R3 (2017), Deloitte and Monetary Authority of Singapore (2017), Monetary Authority of Singapore and the Association of Banks in Singapore (2017).

How would issuing a central bank digital currency impact the financial system?

One of the most important contributions of a central bank to prosperity is its responsibility for financial stability. A breakdown in the financial system can cause enormous economic and social harm. We could not issue a digital currency if it might undermine financial stability.

Depositors might be attracted to a central bank digital currency as it is low risk. This safe asset would compete with deposits in commercial bank accounts, which could be lost if there was a bank failure. This competition could result in three substantial risks to financial stability.

Firstly, if a large number of deposits were held in the digital currency rather than commercial bank accounts, then New Zealand banks might become more reliant on overseas wholesale funding. This would, accentuate our banking system's susceptibility to downturns in overseas markets. For example, if there was an international shock in the European or US markets, this could have more severe flow through to New Zealand via increased bank funding costs (risk spreads) or reduced availability of funding.

Secondly, and relatedly, a central bank digital currency could reduce commercial bank resiliency to economic downturns. This is because commercial banks might have to compete for deposits by offering higher interest rates, which could lower their profitability. Further, commercial banks' payment fee revenues could be diminished if a central bank digital currency offered cheaper domestic and cross-border transaction fees.

Lower bank profitability due to competition might imply that bank activities are being conducted more efficiently (assuming the central bank services were priced appropriately). But there could be adverse consequences for financial stability if less profitable banks become less resilient to shocks, or if they look to replace lost profitability by searching for higher yielding (more risky) assets.

We need to be careful not to exaggerate these concerns, however, as commercial banks are already facing increased competition in the deposit and payments aspects of their business from non-banks such as PayPal and TransferWise. This increased competition has not adversely affected bank resiliency to date. Further, US and Canadian history, where commercial bank banknotes co-circulated with government-issued banknotes, suggests commercial bank money can, to some extent, compete with central bank money.¹⁴

Thirdly, and more troubling, the presence of a low-risk digital currency could increase the probability and severity of bank runs during periods of system-wide instability—depositors could easily, and remotely, transfer large deposit holdings to a central bank digital currency during any wide-spread period of perceived financial instability.

Other miners in the gold rush

The Reserve Bank is not the only participant in the exploration of digital currencies. There are many providers of conventional digital currencies and crypto-currencies. These private currency and DLT providers put competitive pressure on incumbent financial institutions. Competition is good for innovation and efficiencies and could be the most enduring benefit of

¹⁴ This co-circulation persisted until legislation granted central banks' the sole right to issue notes was introduced Fung, Hendry, Weber (2017), Weber (2015)

the global exploration of new financial technologies. We encourage innovations that improve banking and payments services, provided they do not generate systemic risks.

Beyond the payments systems, the Reserve Bank is also responsible for the prudential regulation of banks, non-bank deposit takers and insurers. Private crypto-currencies currently have limited implications for prudentially supervised entities. Entities subject to Reserve Bank prudential regulation face a variety of requirements and incentives to ensure that they manage all their material risks adequately. The Reserve Bank would expect these entities to have prudent risk management in place for any of their activities involving crypto-currencies.

It is not yet clear what prudential scrutiny of a crypto-currency might entail. A crypto-currency itself is not a legal entity, and distributed crypto-currencies like Bitcoin do not have a central agent or issuer to manage the currency. Therefore, crypto-currency regulation could be complex. Currently, the most likely way to regulate crypto-currencies is via crypto-currency exchange platforms (between crypto-currencies and other currencies).

Regardless, the use of crypto-currencies by non-regulated institutions is small compared to the size of our financial system so is unlikely to pose a material risk. And the volatility of crypto-currencies (that do not trade at par value with fiat currency) make it highly improbable that any regulated entity would start predominantly using crypto-currency.

In addition, anti-money laundering and countering financing of terrorism (AML/CFT) legislation might create significant hurdles for financial entities to associate with crypto-currencies. AML/CFT legislation requires financial institutions to know their customers, which is at odds with distributed pseudo-anonymous crypto-currencies. Crypto-currency issuers and crypto-currency exchange platforms would need to remove anonymity from crypto-currencies to implement AML/CFT.

The Reserve Bank does not currently plan to issue any new regulation regarding privately issued crypto-currencies as they do not currently pose a systemic risk to financial stability.¹⁵ Moreover, existing prudential regulation and AML/CFT legislation already set out that supervised entities should manage their business prudently and know their customers.

Conclusion

The gold rush began in New Zealand in 1861. The search for riches continues in today's technological world.

For the Reserve Bank, that is searching for ways to harness new technologies and do things better. We have explored whether issuing a digital currency is one way we can use new technologies to better meet the needs of the public. At this stage it is yet to be seen that a central bank digital currency will bring conclusive benefits.

From a system-wide perspective the pros and cons of a central bank digital currency are mixed. Distributing a central bank digital currency could lead to both new costs and cost savings. It would provide an electronic form of legal tender, but would be less reliable in power outages. The payments pros and cons depend on how the digital currency is

¹⁵ The FMA is responsible for regulating crypto-currency issuers from the perspective of protecting retail investors and promoting orderly markets (as opposed to prudential regulation).

designed. Digital currencies with central control can improve efficiency but potentially at the expense of reduced resilience. There could also be considerable negative impacts on financial stability. Judgement is required to weigh these findings, but it is unlikely that a central bank digital currency would be issued if it posed large and significant risks to New Zealand's financial system.

The payments industry is dynamic, which is good. But the Reserve Bank must be a considered prospector in the exploration for digital currency benefits—we have New Zealand's currency and financial system at stake. Currently, it is too early to determine whether a digital currency should be issued. Central banks and researchers are still probing these technologies and currencies. But we will continue to explore digital currencies; for our benefit and for the benefit of New Zealand's financial system.

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